

A-0875

Total Pages : 4

Roll No. -----

MCS-404/DCA-104

Digital Electronics

(MSCIT/DCA)

1st Semester Examination 2024(Dec.)

Time: 2:00 hrs

Max. Marks: 70

Note : This paper is of Seventy (70) marks divided into Two (02) Section A and B. Attempt the questions contained in these sections according to the detailed instructions given therein. Candidates should limit their answers to the questions on the given answer sheet. No additional (B) answer sheet will be issued.

P.T.O.

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Section-A (Long-Answer-Type Questions)

Note : Section 'A' contains Five (05) long-answer-type questions of Nineteen (19) marks each. Learners are required to answer any Two (02) questions only.

[2x19=38]

- Q.1. a. Prove Huntington's postulates of Boolean Algebra with examples.
- b. Using Boolean Algebra, simplify the expression: $F(A, B, C) = A'B + AB' + A'B'C$.
- Q.2. a. Convert the English statement "If it rains, the ground gets wet" into a logic function.
- b. Represent the logic function in terms of minterms and maxterms.
- Q.3. a. Minimize the Boolean function $F(A, B, C, D) = \sum (1, 3, 7, 11, 15)$ using a four-variable Karnaugh Map.
- b. Describe the significance of don't-care conditions in the minimization process.
- Q.4. Design a combinational circuit for a 4-to-1 multiplexer using logic gates. Show its truth table and derive the Boolean expression for the output.

- Q.5. Compare and contrast synchronous and asynchronous counters. Design a 3-bit asynchronous ripple counter using T flip-flops and explain its working with timing diagrams.

Section-B (Short-Answer-Type Questions)

Note : Section 'B' contains Eight (08) short-answer-type questions of Eight (08) marks each. Learners are required to answer any Four (04) questions only.

[4x8=32]

- Q.1. Perform the following number system conversions:
- a. $(1101.101)_2$ to decimal
 - b. $(247)_8$ to binary.
- Q.2. What is the Hamming Code? Explain how error detection and correction are achieved using it.

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- Q.3. Derive the dual of the Boolean expression $F = AB + A'C$.
- Q.4. Explain the Quine-McClusky method for simplification of Boolean expressions.
- Q.5. Draw the logic circuit of a XOR gate using only NAND gates.
- Q.6. Explain the working principle of a JK flip-flop with its truth table and characteristic equation.
- Q.7. Compare and contrast SRAM and DRAM based on speed, cost, and applications.
- Q.8. Explain the working of a Serial-In Parallel-Out (SIPO) shift register with a neat diagram.
